

PSA Bounce was seen in 7.2% of patients. Acute urinary retention rate was 4%. Mean Acute increase in IPSS scores was 6 points. There was no difference in acute GU toxicity between EBRT or brachytherapy boost doses. There was also no difference in acute toxicity if brachytherapy was done before or after EBRT. The rate of Late Grade 2+ GU toxicity was 13%. The rate of late Grade 2+ GI toxicity was 1.8%.

Conclusions: This data shows excellent biochemical control comparable to most large series with HDR brachytherapy boost for prostate cancer. Toxicity was similar between dose regimens and further justifies moving towards hypofractionated regimens.

107 CARO-ELEKTA FELLOWSHIP

PROSPECTIVE STUDY OF DYNAMIC CONTRAST-ENHANCED MRI, DIFFUSION-WEIGHTED MRI, AND FDG PET IMAGING IN BRACHYTHERAPY FOR CERVIX CANCER

Kathy Han, Jennifer Croke, Ur Metser, Warren Foltz, Jason Xie, Tina Shek, Brandon Driscoll, Cynthia Menard, Doug Vine, Catherine Coolens, Anna Simeonov, Akbar Beiki-Ardakani, Eric Leung, Wilfred Levin, Anthony Fyles, Michael Milosevic
Princess Margaret Cancer Centre, University of Toronto, Toronto, ON

Purpose: Previous studies using T2-weighted (T2w) MRI showed significant uncertainties in brachytherapy target delineation, with conformity index for gross tumour volume at brachytherapy (GTVB) of 0.58-0.60. We examined the feasibility and utility of dynamic contrast-enhanced MRI (DCE-MRI), diffusion-weighted MRI (DWI), and FDG PET imaging for brachytherapy target delineation in patients with locally advanced cervical cancer.

Methods and Materials: Twenty-two patients with cervical squamous cell carcinoma or adenocarcinoma (12 Stage IB/IIA, 7 IIB, 3 III/IVA) treated with definitive chemoradiation had DWI, DCE-MRI, and FDG PET/CT scan after brachytherapy applicator insertion, in addition to standard T2w MRI at 3T. GTVB and high-risk clinical target volume (HRCTV) were contoured first on the axial T2w images by a single observer on the day of brachytherapy. The DWI, DWI-derived apparent diffusion coefficient map, DCE-MRI and FDG PET images were then reviewed, and if indicated the GTVB and/or HRCTV were modified to define the target more accurately, and/or include areas of suspected disease on DWI/DCE-MRI/FDG PET not obvious on T2w MR. Target delineation was performed by a second observer after brachytherapy treatment in the same manner. The primary endpoints were (1) feasibility; and (2) utility, determined by (a) the number of patients whose target volumes were modified based on DWI/DCE-MRI/FDG PET, and (b) interobserver variability using the conformity index (ratio between common and union volumes of a pair of contours by observers).

Results: It was feasible to perform DWI, DCE-MRI and FDG PET without significantly delaying patients' brachytherapy treatment. The conformity indices for T2w-derived GTVB and HRCTV were 0.57 and 0.76, respectively. Eleven (50%) patients' T2w-GTVB contours were modified on the day of brachytherapy (Observer 1): seven based on better demarcation of the GTVB on DWI/DCE-MRI/FDG PET, and four based on DWI/DCE-MRI/FDG PET showing residual disease not well visualized on T2w MRI. GTVB was modified in 17 patients by Observer 2 (11 and six, respectively). Overall, Observer 1 found DWI, DCE-MRI and FDG PET useful for GTVB modification in nine, 11 and five patients, respectively; and in nine, 14 and eight patients respectively for Observer 2. For those patients, incorporation of functional imaging improved the conformity index for GTVB from 0.57 to 0.66 ($p < 0.001$). HRCTV was modified in three and eight patients by Observers 1 and 2, respectively, with a trend towards higher conformity index using functional imaging (0.71 to 0.76, $p = 0.06$).

Conclusions: DWI, DCE-MRI and FDG PET imaging decreased interobserver variability in GTVB target delineation. Given data from retroEMBACE showing the importance of minimum dose to the GTVB, reducing uncertainties in its delineation is of great importance.

108

IMPACT OF DECLINING HR-CTV VOLUME OVER A COURSE OF CERVICAL BRACHYTHERAPY ON OAR DOSES

Peter Lim, Rustom Dubash, Conrad Yuen, Lorenz Yeung, Christina Aquino-Parsons
British Columbia Cancer Agency, Vancouver, BC

Purpose: Over a multi-fraction course of intra-cavitary cervical brachytherapy (BT), treatment response will cause the HR-CTV to shrink. If BT is planned to conform to the HR-CTV, this change may impact dose to normal structures, having implications for BT scheduling and planning.

Methods and Materials: Fifty patients receiving 26 Gy/4# or 30Gy/5# intracavitary brachytherapy between January 1, 2014 and December 31, 2015 as part of radical treatment for cervix or endometrial cancer were included in this study. Each fraction of BT was individually planned with the oncologist having available information from initial staging, EUA on day BT, intra-operative trans-abdominal u/s and CT-simulation. With a median time of 27.1 days (range 9-43) between first and last implant, HR-CTV volume, point A dose and D2cc of bladder, rectum, sigmoid and small bowel were calculated for the first and last implant and compared using a paired t-test.

Results: Between the first and last BT, HR-CTV volume shrank from a median of 23.7 cc to 15.5 cc ($p = 0.001$). This was associated with a reduction in median Point A dose from 520 cGy to 485.5 cGy ($p = 0.002$). Rectal, sigmoid and small bowel doses were not significantly different between the first implant and last with median D2cc of 221.5 versus 192.0 cGy ($p = 0.9$), 360.5 versus 361.0 cGy ($p = 0.3$) and 173.0 versus 154.5 cGy ($p = 0.9$), respectively. However, median bladder D2cc dropped from 530.0 to 486.0 cGy ($p = 0.0003$).

Conclusions: Modest reductions in the size of the HR-CTV over the course of cervical BT are measurable and resulted in reductions in point A dose as well as bladder D2cc. These observations suggest that conforming BT to HR-CTV rather than point A and delivering BT after the cervix has been cytoreduced can potentially reduce bladder side effects.

109

EVALUATION OF SURVIVAL AND TREATMENT TOXICITY WITH HIGH-DOSE RATE BRACHYTHERAPY WITH COBALT 60 IN CARCINOMA OF CERVIX

Amir Shahram, Yousefi Kashi, Afshin Rakhsha, Seied Mohsen Hoseini
Shahid Beheshti University of Medical Sciences, Tehran, Iran

Purpose: Cervical cancer remains to be a major health problem and cancer-related cause of death among women in developing countries such as Iran where the most cases are diagnosed in locally advanced stage. This cross sectional-analytic study aims to report outcome 154 patients with carcinoma of cervix were treated with external beam radiation therapy (EBRT) and high-dose rate (HDR) brachytherapy with cobalt 60 (Co-60) remote after loading system.

Methods and Materials: A total of 154 patients with the international federation of gynecologist and oncologist (FIGO) Stages I-IVA with histopathologically confirmed carcinoma of cervix, followed by the radiation-oncology ward of Shohada-e-Tajrish Hospital in Tehran, Iran, between February 2008 and March 2015. They were completed their scheduled EBRT and HDR brachytherapy with Co-60 remote after loading system. Out of this, 132 patients completed their standard follow up protocol. They were analyzed for three-year disease-free survival (DFS), three-year overall survival (OS) incidence of acute and late complications for HDR brachytherapy.

Results: Fourteen patients (9.1 %) were in Stage I (FIGO classification), 8 (5.2%) were in Stage IIA, 26 (16.9%) were in Stage IIB, 100 (64.9%) were in Stage III, and 6 (3.9 %) were in Stage IVA. The follow up duration was between 6 - 60 months with a median of 38 months. Overall rectal and bladder treatment toxicity rates were 33.7%. The three-year DFS rate was 85.7%, 70.7 %, 41% and 16.6% for Stages I, II, III, IVA